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St. Bartholomew's Hospital Journal,

SEPTEMBER 14th, 1894.

"Æquam memento rebus in arduis
Servare mentem."—*Horace*, Book ii., Ode iii.

On the Removal of Individual Bones of the Tarsus and Metatarsus for Tuberculous Disease.

By HOWARD MARSH, F.R.C.S.,
Surgeon to the Hospital and Lecturer on Surgery.

I HAVE lately been reminded of this subject by meeting with three cases in which, while I was Surgeon to the Hospital for Sick Children, I removed single tarsal or metatarsal bones in dealing with tuberculosis of the foot. I remember a paper, published some years ago, in the *British Medical Journal*, by Brigade-Surgeon Godwin, in which he alluded to the fact that a very useful foot may still remain although some of its principal parts have been removed; and he mentions the conservative practice that has been founded on this experience as "one of the minor advances of modern operative surgery." Mr. Timothy Holmes was one of the first to draw attention to this subject at the Hospital for Sick Children: and his "Surgical Diseases of Children," published in 1868, contains an instructive chapter in illustration of it.

The three principal bones of the foot are the os calcis, the astragalus, and the metatarsal bone of the great toe; and, considering the part they severally play in the mechanism of the lower extremity, the student of anatomy might very well ask, what would be the condition of the foot when any one of these had been removed? This inquiry is of much importance, also, from a clinical point of view. Tuberculous disease frequently begins in, and for a time remains limited to, a single tarsal bone. With early rest and treatment of the general health, the great majority of cases end in recovery. If, on the other hand, cases are neglected, the neighbouring parts of the foot become involved, and at length some extensive operation, even amputation, may be required. There is a time, however, at which, although suppuration has occurred, and sinuses have formed, and although redness of the skin and swelling of the soft parts may suggest extensive disease, examination may indicate that mischief is still confined to a single bone; and there is good evidence to show that if this particular bone is carefully dissected out, sound repair will usually follow. It is only by keeping all this in mind that the surgeon can avoid the resort to amputations of the foot that ought never to have been performed. It must be allowed that the necessary accuracy of diagnosis is by no means easy. In many cases it is very difficult. The external appearances produced by disease of the os calcis, or of the astragalus, are often closely similar to those which depend on disease of the ankle joint. But a correct conclusion may generally be arrived at (1) by observing that although sinuses open close to the ankle, and just where they often do when the joint itself is diseased, yet, a probe passed into them runs not towards the joint, but towards, and often into, one of the bones. (2) The movements of the joint are found to be free, or only slightly impaired (as they may be from swelling and matting of the surrounding soft parts). (3) Although considerable swelling is present, and although, at a first glance, it may seem to involve the joint, it does

not in reality do so. This is a very important point. Swelling depending on advanced disease of the joint itself can be traced on all its aspects, but when the os calcis alone is affected, although the swelling is very marked below and behind the joint, as well as laterally below the malleoli, it is entirely absent towards the front of the joint, under the extensor tendons; while, when the astragalus is involved, although swelling is present in front of the ankle, and probably also at the lateral aspects of the joint, yet at the back of the joint, on either side of the tendo-Achillis (where swelling is well marked in disease of the ankle) it is absent.

Supposing the surgeon has convinced himself that the os calcis is so widely diseased that mere free drainage and prolonged rest will not be sufficient, but that further operative interference is called for, and supposing that on examination no sequestrum is found, but that extensive caries is present, so that only a shell of bone remains, then instead of gouging away the carious interior, the best course will be to dissect the entire bone out. The method by which this is done, however, will exercise a considerable influence on the future usefulness of the foot. The best incision for the purpose, I think, is one which, beginning on the inner side of the tendo-Achillis, just above its insertion, runs horizontally outwards, across the posterior aspect of the os calcis, and then horizontally forward along its outer surface as far as the calcaneo-cuboid joint, that is to a point about midway between the external malleolus and the base of the fifth metatarsal bone. It then turns at a right angle, and runs downwards, and then inwards nearly to the middle line of the sole. The tendo-Achillis is at once divided, but care should be taken to expose without dividing the two peronei, so that they can be hooked aside. The whole thickness of the flap mapped out by this incision should be dissected off the bone and turned downwards. By keeping the point of the knife close upon the bone, only those structures which are directly attached to the os calcis will be cut. The easiest way of proceeding is to divide the middle fasciculus of the external lateral ligament and the ligaments connecting the os calcis with the cuboid, and to open the calcaneo-cuboid joint, then to divide the ligaments connecting the os calcis with the astragalus, and turn the foot strongly inwards; the interosseous ligament can now be cut, and the soft parts detached from the inner side of the bone, care being used to cut neither the flexor longus hallucis where it lies in the groove beneath the sustentaculum tali, nor the plantar vessels or nerves. I have performed this operation some five or six times. The cavity left after the removal of the bone has filled up, though slowly, the patients have been able to walk long distances and to stand on tip-toe; and when the loss in height has been made up by the addition of a thick heel to the boot, the defect has been scarcely noticeable.

Equally favourable results may follow removal of the astragalus. The condition of the foot after the operation has been performed for tuberculosis is better than when it has been done in instances of relapsed talipes varus; for in the latter condition, the foot is often undergrown, and so distorted in its anterior segment, so that mere removal of the astragalus cannot entirely correct its position; whereas, in tuberculous cases the general position of the foot is good. I have seen children, after removal of the astragalus, who walked with scarcely any defect, and, on examination, a good deal of flexion and extension has been found to be present, owing to the connection of the tibia and fibula with the os calcis by means of a firm but not close cicatrical union.

The astragalus can be removed without the division of any tendons, by the following method, which has long been in use:—An incision starts from the lower and back part of the external malleolus, and runs forward in a curved direction till the outermost tendon on the front of the foot (the peroneus tertius) is reached. It divides only the skin and subcutaneous tissue. The tendons of the peronei brevis and longus are hooked upwards and preserved. The three fasciculi of the external lateral ligament are divided, and the joint between the head of the astragalus and the scaphoid is opened. The bone is then gradually raised from its bed, and its connections, as they are severally met with and defined, are divided. The dissection is unavoidably tedious, but the more carefully it is performed, the smaller will be the damage done to the surrounding structures.

The metatarsal bone of the great toe is not very rarely the seat of tuberculous disease involving its cancellous tissue. The mischief usually commences at its base, in the growing tissue of the diaphysis immediately beneath the epiphysial plate; and if the case is neglected, almost the whole of the cancellous tissue may be replaced by granulation tissue, loaded with caseating tuberculous products, so that the bone is little more than a shell. It is then best to dissect it out. This can be done through an incision which runs along the dorsal aspect of the bone, from its base to its head, and then turns inwards and downwards to the sole. The tendon of the extensor longus hallucis is exposed without being injured, and is drawn outwards; the metatarso-phalangeal joint is opened; and, by the use of the point of the knife kept close to the bone, the soft parts are divided and retracted, and the periosteum is, as far as possible, preserved. With care and patience (a rugine, or periosteal elevator, will be useful) the bone can be removed without division of either the abductor or the flexor brevis hallucis. The communicating branch from the dorsal artery of the foot to the external plantar, or even the external plantar artery itself, may be cut during the removal of the tarsal end of the bone; but the divided vessels are easily secured. The tendon of the peroneus longus, no doubt, acquires attachment to the cicatrix in

the immediate neighbourhood of its original insertion into the base of the metatarsal bone; while its insertion into the internal cuneiform—slight, it is true, but useful as a holdfast—need not, if care is taken, be divided. The result of this operation, when it is remembered that the metatarsal bone of the great toe is the principal part of the anterior portion of the arch of the foot, is somewhat surprising. The toe is considerably shortened; but this is the only marked defect. The strength of the foot, and the patient's powers of movement, seem to be impaired in no material degree; indeed, when the periosteum can be stripped off with the other soft parts, and saved, the shaft of the bone is to some extent re-formed.

The three cases to which I have alluded above, severally showed the ultimate results of removing the os calcis, the astragalus, and the first metatarsal bone.

Case I.—Removal of the os calcis.—The operation was performed when the patient was six, thirteen years ago. On examination of the foot, it was observed that the prominence of the heel was almost completely lost, and that the malleoli were, when the patient was standing, not more than three-quarters of an inch from the ground. Thus the foot had the appearance of being much misshapen. The muscles of the calf were somewhat wasted, and the tendo-Achillis was smaller than that of the opposite limb. It was, however, firmly attached to the cicatricial tissue of the heel. The patient could stand on tip-toe easily and hop to some extent. He wore a boot the heel of which was raised about an inch and a half. With this he could walk almost as well as on the other foot, and was scarcely at all lame.

A case was recorded some years ago in one of the journals which showed how little the removal of the os calcis may impair the usefulness of the foot. In some districts of the Midland Counties there is a performance in vogue called the heel-and-toe dance. The heel and the toe of the boot are tipped with metal, and he is adjudged best at the game who can produce the most rapid, artistic and varied succession of heel-and-toe raps upon the floor. In a dancer who had long been champion, disease of the os calcis was developed, and, after a time, the bone was dissected out. In spite of this loss, however, he still maintained his position as champion in the competition.

Case II.—Removal of the astragalus.—The patient, now seventeen, had tuberculous disease of the astragalus when she was four years old. I removed the bone when she was five. The two chief respects in which the shape of the foot was changed were that it was almost completely flat, and that the malleoli were much nearer the ground than they normally would be. But the patient could flex and extend the foot upon the leg, through fully three-quarters of the normal range, and had, though in a diminished degree, the power of hopping and of standing on tip-toe on the limb. She wore a boot three-quarters of an inch thicker in the sole than the other, and with this she walked with so slight a degree of lameness that it would scarcely be observed.

Case III.—Removal of the metatarsal bone of the great toe.—The operation had been performed eleven years ago, when the patient was a boy of nine. The toe was now half an inch shorter than the great toe of the other foot. In the normal situation of the metatarsal bone the structures felt dense and firm. The patient could stand on tip-toe, though with some weakness, and he walked with no appreciable defect. One foot appeared for all practical purposes as good as the other.

These operations are but seldom required. They are entirely unnecessary in the early stages of tuberculosis, and before septic sinuses have formed. In cases in which sepsis have occurred, and the disease has spread beyond the single bone originally involved, they are insufficient; but in appropriate cases, presenting the conditions I have indicated, they afford very satisfactory results. The essential points are the selection of suitable cases by means of accurate diagnosis, and an operation carefully planned and carried out with the smallest possible disturbance of surrounding structures.

Izal in its Surgical Aspects.

BY

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FOR close upon two years I have scarcely used any other disinfectant than Izal; and gauze soaked in Izal has served me as a surgical dressing. I have employed Izal largely for irrigation purposes, as well as for my hands, sponges, and instruments. It is interesting therefore to see how far it has fulfilled its purpose, and what are its advantages and disadvantages as compared with carbolic acid and other more commonly employed antiseptics. It is to Dr. Klein that I am indebted for first drawing my attention to the valuable properties of which it is possessed. It had been submitted to him by Messrs. Newton, Chambers, & Co., of the Thorncliffe Ironworks and Collieries, near Sheffield, having been obtained by them as a by-product during the process of coke manufacture. It is not uninteresting to turn for a moment to the steps which led up to its discovery, and the methods by which its antiseptic properties were first elucidated by rough experiment at the works before it was submitted by Dr. Klein to more rigid tests by means of which its full value was ascertained.

A chance crack in a gas retort caused the leakage into it of a small quantity of moisture, which, it is needless to say,

was speedily converted into steam, and caused the coke to be produced at a much lower temperature, whilst an oily-looking substance fell to the bottom of the retort, and the smoke issuing from the chimney was reduced to a minimum. Step by step the nature of this oily material was investigated by Mr. Worrall, chemist to the Thorncliffe Works, and its exact composition ascertained. Several other by-products of considerable value have been obtained, and the smoke which formerly issued from the chimneys of the works and blacken the country around has ceased to exist. The workmen who were engaged in the manufacture soon discovered that cuts dressed with Izal healed far more readily than those dressed by any other of the plans usually in vogue at the works, with the result that a sample was submitted to Dr. Klein for examination, who soon ascertained that it possessed very remarkable disinfectant properties, was non-irritant, and so far as the higher animals are concerned it exerted no poisonous influence whatsoever, even in very concentrated solutions. On the lower forms of life, however, its destructive properties proved to be very considerable.

The following is a quotation from Dr. Klein's statement:—

"Now I have to add a simple statement with reference to all species mentioned as 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21 and 25,* for in all these instances the disinfectant used in the strength of 1 in 200 completely destroys in five minutes the vitality of the microbes; no living cultures can be produced with them. The experiments were made at first also in this instance with the disinfectant of the strength of 1 in 100, exposing the microbes in it for five, ten, and fifteen minutes; and also to 1 in 200, exposure fifteen minutes; but it need hardly be said that all vitality was destroyed, as already 1 in 200 for five minutes is a complete disinfectant. (It may not be unnecessary to state here that the same cultivations of bacillus diphtheriæ and bacillus of typhoid used in this series of experiments—namely, exposure in the disinfectant of the strength of 1 in 200—were used, and with exactly the same methods also, for comparative experiments of disinfection with carbolic acid.) Crystals of absolute phenol were dissolved in water so as to form a solution of the strength of 1 in 200; the microbes were then introduced into this solution and exposed to its action for various periods. As a result it was found that an exposure for two hours in 0.5 per cent. carbolic acid, *i.e.*, 1 in 200, does not in the least injure the bacilli; good and typical growth can be established with them after the exposure. With regard to species 22, 23, and 24 (streptococci), these I knew from previous experiments with other disinfectants to be less resistant than the staphylococci and bacilli. I have, therefore, subjected these three species to the disinfectant in weaker strength, namely 1 in 300, and found that an exposure for five minutes in this mixture is fatal to these microbes, streptococcus pyogenes, streptococcus of erysipelas, and streptococcus of scarlatina. From these series it follows that an exposure for five minutes in the strength of 1 in 200 (1 in 200 would mean one ounce of the disinfectant emulsion distributed in ten pints of water) completely destroys the vitality of the microbes of diphtheria, typhoid fever, fowl cholera, swine fever, glanders, cholera, of suppuration, of erysipelas, scarlatina, and other non-sporing pathogenic and non-pathogenic species."

In addition to these experiments on the destruction of microbes, Dr. Klein made some researches as to the solutions that should be used with a view to inhibiting their growth, and states:—

"The result of all experiments on inhibition may be briefly summarised for all the twenty-five species tested, namely: (1) Spores do not germinate in medicated gelatine or broth if the amount of disinfectant added is 0·1 per cent.; (2) no micrococcus (staphylococci and streptococci) is capable of growing in medicated gelatine or broth of the strength of 0·1 per cent. medication; (3) all non-sporing bacilli and spirilla fail to grow in medicated gelatine or broth of the strength of 0·1 per cent. medication; (4) excepted from this are the bacillus prodigiosus and the bacillus of typhoid—the bacillus prodigiosus shows growth on gelatine medicated 0·1 per cent.; the growth is retarded, and always starts from the superficial layer of the medium; it proceeds considerably slower than on normal gelatine."

Starting from these experiments of Dr. Klein's I had some Izal mixed with water in the proportion of 1 to 200, and have used it much in the same way as any other disinfectant, such as carbolic acid, corrosive sublimate, &c. Pure Izal itself is so thick and almost glutinous, being in its natural condition about of the consistency of thick cream, that in practice it is convenient to have it diluted down somewhat before use, as it does not readily mix with water all in a moment, but there is no reason why it should not be mixed immediately preceding an operation if care be taken in the process, and thus used it has the merit of portability; a drachm and a quarter in a pint of water makes a solution of the required strength (1 in 200). For washing out bladders, for throat gargles, or for ulcers it may be used weaker still, and yet with equally beneficial result.

Izal does not in reality form a solution at all when mixed with water, but only an emulsion. It will dissolve in caustic alkalies, but no longer retains its non-irritating

* "The microbes which have been experimented with were the following: (1) Spores of bacillus subtilis (hay bacillus); (2) spores of bacillus mesentericus (a common putrefactive microbe); (3) spores of bacillus anthracis; (4) bacillus subtilis, non-spore bearing forms; (5) bacillus mesentericus, non-spore bearing forms; (6) bacillus anthracis of the blood of an animal dead of virulent anthrax; (7) bacillus of diphtheria; (8) bacillus of typhoid fever; (9) bacillus of glanders; (10) bacillus of septicæmia (mouse); (11) bacillus of fowl cholera; (12) bacillus of fowl enteritis; (13) bacillus of pneumonia; (14) bacillus of grouse disease; (15) bacillus of swine fever; (16) bacillus of swine erysipelas; (17) bacillus prodigiosus (pink), non-pathogenic; (18) spirillum of Finkler; (19) spirillum of cholera (cholera bacillus); (20) staphylococcus pyogenes aureus; (21) staphylococcus pyogenes albus; (22) streptococcus pyogenes; (23) streptococcus of erysipelas; (24) streptococcus of scarlatina; (25) proteus vulgaris (the common microbe of putrefaction)."

character, which is so marked a characteristic of it whether in a pure or in a diluted condition. The pure substance has no irritating effect whatever on the skin, but is somewhat pungent to the taste. From a germicidal point of view this comparative inability to form chemical compounds is undoubtedly of considerable advantage. It cannot combine with the tissues of the body, and hence retains its germicidal properties for a lengthened period; and in this respect it differs greatly from such a disinfectant as corrosive sublimate, which by combining with the albuminous substances of the body, soon loses its power of disinfection.

Its employment for surgical dressings and ligatures.—The gauze which is used for this purpose is the ordinary gauze of commerce, and can be easily prepared by anyone. It is boiled for half an hour on two separate occasions in Izal (1 in 200), and then allowed to remain in the fluid in which it has been boiled until it is required for use. The surplus fluid is squeezed out, and the gauze applied like any other dressing. After the gauze has remained in the fluid for several days the fluid becomes almost clear, the Izal becoming fixed in the gauze. Ligatures can be prepared precisely in a similar fashion, though as a rule I have preferred to keep them in carbolic acid, which is clear, and enables one more readily to see exactly what one requires. In the case of sponges they are best cleaned by soaking them in a strong solution of washing soda (about a teacupful to a quart of water is ample) for twenty-four hours. After this they should be rinsed five or six times in ordinary water until they are perfectly clean, and then kept in Izal (1 in 200) until they are required for use. As Izal does not break up the blood clot like carbolic acid and corrosive sublimate, the difficulty of cleaning ones sponges and instruments after an operation is much less than with any other disinfectant ordinarily in use. In addition to its powerful germicidal properties it does not irritate the surgeon's hands or the patient's skin. This non-irritating character is further seen when it is employed either in washing out a peritoneal abscess, a foul bladder, or a stinking sinus. In one or two instances in which an old sinus has been hyperdistended with this fluid the effect has been very remarkable, and has caused it to heal with great rapidity, but the uncertainties which always surround the course and direction of any fistulous tract hold out but little hope of any drug panacea for their removal. It is however no small matter to feel that in using Izal one is employing a most powerful disinfectant, and at the same time one that is absolutely innocuous whether it is used for ordinary wound purposes, for washing out large abscesses, or to purify foul mucous membranes. I am well satisfied with it and shall not be easily induced to revert to the use of carbolic acid or sublimate.

Notes on Aseptic Surgery.

By C. B. Lockwood, F.R.C.S.,

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THE following notes are founded upon the demonstrations which I have been giving in the wards, and on Saturday afternoons in the operation theatre. They are merely "notes" and have no pretensions to completeness. They have been jotted down at various odd times, and are now published in our Journal, because I have been told that they may be of use to those with whom I have to work in the wards and in the operation theatre. At present the methods which I employ seem to be handed down by a kind of oral tradition, so that house-surgeons, dressers, sisters, and nurses are sometimes at fault to know what to get ready for operations, or how to prepare the required materials, or the patients. These points will, therefore, be dealt with as simply and briefly as possible; and in doing so I will try and make clear the reasons upon which the various details are based. It is quite impossible to practise aseptic surgery with success, unless not only the surgeon and his assistant but also the sisters and nurses, have a clear and distinct knowledge of the principles upon which it is based. Moreover, they must all possess a firm conviction of the truth of those principles.

This conviction does not grow in a day, but comes gradually, as we see that aseptic surgery is founded upon reason, is capable of proof, and gives the results which were promised.

Before we discuss the two great principles of aseptic surgery, the meaning of certain words which must often be used ought to be defined. First, I refer to the words "septic" and "aseptic," and it will be seen that both here and elsewhere various references will be given to what others have written. Those who wish to dip deeper into this subject and to know it better, are advised to consult these authorities themselves, and not to take them at second-hand.

There can be no doubt but that the word septic had originally its literal meaning and was applied to wounds which had the odour of putrefaction (σήπειν: *to make rotten* or *putrid*). This was evidently the sense in which it was used by the authors of the Pathological Society's Report upon septicæmia and pyæmia in 1879,* and by all the earlier writers upon surgery. Further, it was a matter of common observation that these septic wounds were prone to be associated with septicæmia, pyæmia, erysipelas, hospital gangrene, and so forth. In consequence, this class of diseases were themselves often referred to as septic diseases, and their occurrence was observed when wounds became putrid.

* Pathological Soc. Trans., vol. xxx, p. 1, *et seq.*

Cases were observed, however, in which septicæmia or pyæmia occurred without any decomposition of the fluids in contact with the wound.* The discovery of more exact methods, especially Koch's invaluable method of cultivating bacteria upon solid nutrient media,† such as gelatin,‡ or agar-agar, explained this mystery, and showed that many of the bacteria of septicæmia and pyæmia caused no odour of putrefaction.

On the other hand, many of these bacteria reveal their presence by causing inflammation and suppuration, so that pus became an important indication. At the present time I believe it is correct to say that most surgeons would call a pus-producing wound "septic," quite apart from the occurrence of a putrid odour.

Used in this way, it is clear that the word "septic" has been divorced from its original meaning, and implies that the wound is infected with pyogenic bacteria, which, it is to be remembered, are also capable of causing pyæmia, septicæmia, and other grave affections. Pus is, however, rather a crude test of wound infection. I have often, by means of culture experiments, ascertained the presence of bacteria, such as staphylococcus aureus or streptococcus pyogenes, in wounds many hours before any pus appeared. There are some who hardly recognise the presence of pus unless considerable quantities are present. Those who are accustomed to inoculate culture materials from the wounds which they have treated, know that the slightest moisture is a highly suspicious circumstance, and nearly always implies infection.

There is yet another class of wounds which is infected with various kinds of bacteria derived from the patients' skin. In some of these the suppuration is so slight that it is often ignored; in others it is absent. The pathogenic properties of these skin bacteria are almost unknown, so that provisionally it is wise to class them with the other pyogenic bacteria, and call the wounds in which they occur septic. It will be easy, when our knowledge permits, to give more definite names to wounds of this kind.

Thus the word "septic" always implies the presence of bacteria; but not necessarily the presence of those of putrefaction, or even those of suppuration. I have been asked whether I should call a wound which contained tubercle bacilli "septic." No; I should call it "tubercular," thus placing it in its proper class. It might, of course, be —and usually is—septic as well as tubercular. In truth, it may be imagined that, as our knowledge grows, wounds which are now called septic will gradually fall into other classes. This, however, in no way affects the principles of of our wound treatment, which, as will be seen, aims at the absolute exclusion of all bacteria, quite irrespective of their supposed properties.

In the following notes the term aseptic will be applied to wounds or things which contain no bacteria, or, in other words, which are sterile; also any method of wound treatment which aims at sterility will be called aseptic. This is slightly different from the sense in which the word is used by some surgeons. For instance, in a popular French text-book* three methods of wound treatment are described: the aseptic, which aims at sterility by the use of dry or moist heat for all instruments, dressings, or materials; the antiseptic, which aims at attaining the same end by the use of chemicals; and, lastly, the mixed method in which both of the preceding are used. It will be seen later that the mixed method is the one which I am in the habit of using, but with an abiding faith in the efficacy of heat, and a profound scepticism as to the power of chemicals. Thus the word aseptic has undergone some evolution since, in 1882, Mr. Watson Cheyne wrote that the method "introduced by Mr. Lister . . . attains the ideal of results, viz., a complete absence of putrefaction—an asepsis. His method, then, is best designated by the term expressing its result—Aseptic."†

With regard to two other words which are also in constant use, namely, "antiseptic" and "disinfectant," it is customary to say that an *antiseptic* is that which prevents or retards the growth of bacteria, and a *disinfectant* is that which kills them outright. In this sense an antiseptic would be useless as a disinfectant, although a chemical disinfectant might, when diluted, become an antiseptic. All this may seem rather casuistical and complicated, but the differences must be mastered, otherwise antiseptics will be used under the impression that they are disinfectants. I can adduce an instance in which my ignorance of the fact that I was only using an antiseptic, when I ought to have used a disinfectant, probably cost the unfortunate patient her life.

The two great principles upon which aseptic surgery is founded are, as I have stated elsewhere‡: (1) That the healthy unexposed tissues are sterile; (2) That suppuration and the other septic diseases of wounds are due to microbes introduced from without. It would require volumes to narrate the facts upon which these two inductions are based. Each one must convince himself or herself of these truths by study, and, if possible, by experiment. Everyone ought to read, at least, the writings of our greatest surgeon, Sir Joseph Lister,§ and the lucid experiments of the late Professor Tyndall.‖ The work of

* Pathological Society's Report, p. 29.

† "Mittheilungen a. d. Kaiserlichen Gesundheitsamte," vol. i., 1881, p. 18. Translated by Victor Horsley, for New Sydenham Society, 1886.

‡ The gelatin which is used is the same kind as that which is used for making the ordinary jelly which is served at table. It melts at a temperature a little higher than summer heat. Agar-agar is a firmer kind of gelatin, which bears a much higher temperature, and melts at about 50 C.

* "Manuel de Petite Chirurgie de Jamain," 7e éd., by Terrier et Péraire. 1893.

† "Antiseptic Surgery." W. Watson Cheyne. 1882. Page 51, foot-note.

‡ See three reports on Aseptic and Septic Surgical Cases, *British Medical Journal*, Oct. 25, 1890; May 28, 1892; and Jan. 27, 1894.

§ I have daily reason to deplore that the epoch-making writings of Sir Joseph Lister have not been collected and published in a single work, as has just been done for the late Sir William Bowman.

‖ "Essays on the Floating-matter of the air in relation to Putrefaction and Infection." London, 1881.

the last scientist is a sure foundation upon which to build.

Asepsis would be impossible were it not that the healthy unexposed tissues and organs are sterile. This has been ascertained by the convincing experiments of Lister, Pasteur, Tyndall, and others,* and is confirmed every moment by the results of surgical practice. Investigations show that bacteria are absent from the blood and from the various organs—from the kidneys, ureters, bladder, and urethra, and from the urine of healthy individuals; from the liver, gall bladder, and biliary ducts, and from the bile; from the salivary glands, and the saliva in their ducts; from the acini of the lungs and smaller bronchioles, and from the expired air, provided it is not mixed with the secretions of the mouth or air passages; they are also absent from the mammary gland, and from the milk in its ducts, and from other organs and secretions which it is unnecessary to specify. The entrances into the various ducts and passages are, however, exceptions to these rules; so that, to obtain the various secretions uncontaminated with bacteria, stringent precautions are required.

The absence of bacteria from the various tissues, organs, and fluids may be ascertained by direct observations. Bacteria cannot be seen in any of them so long as they are obtained from healthy individuals. Improvements in microscopicial methods only serve to establish this statement upon a surer basis. It is obvious, however, that such minute objects as bacteria might elude the most patient and skilful search.

But experiments fully substantiate the results of direct observation. Portions of organs or tissues may be kept under a protecting shade or in nutrient media for indefinite periods without any change occurring. I have before me a piece of fat which was removed from the healthy living body more than two years ago. It has floated in nutrient broth all this time without any change at a temperature the most favourable for the growth of bacteria. The fat looks as fresh and yellow as the day of its removal from the body, and the broth as clear as when it was made. In other tubes of nutrient fluid are portions of skin and subcutaneous tissue, of muscle, and of peritoneum, all of which have behaved the same. Had any of the ordinary bacteria been present in these tissues decomposition would inevitably have ensued. It has been abundantly proved by the experiments of Pasteur, Lister, Tyndall and others, that the decomposition of dead organic substances is caused by bacteria. The slight chemical changes which sterile dead organic substances undergo owing to the slow conversion of albumen and fat into other compounds, and owing to crystallisation, need not be taken into account. By some observers whole organs have been preserved entire by simply protecting them from bacterial contamination. Furthermore, it is now a matter of everyday knowledge that milk, vegetables, fruit, and meats of various kinds, can be preserved almost indefinitely by destroying the bacteria which may have got into them, and by afterwards protecting them from fresh contamination. Anyone who has worked at experimental pathology soon becomes convinced of the truth of this great induction. Not only can he grow nothing from healthy tissues, but after successful inoculation with pure cultures of anthrax, tubercle, staphylococcus aureus, or streptococcus pyogenes, and so forth, he finds in the tissues the organism he placed there, and none other.

For the success of experiments such as I have mentioned, much depends upon the skill and accuracy of the experimenter, and upon the ease with which the organ can be removed from the body. Some are more easily contaminated than others, and it is particularly difficult to succeed with very hairy animals. Here again, as the knowledge and skill of experimenters grow, better and more certain results are obtained, and the sterility of the healthy tissues and organs becomes more fully substantiated. The controversy which has raged around this most important subject, reminds one of that which was waged over the theory of spontaneous generation; and there is no doubt but that it is ending in the victory of those who believe in the sterility of the healthy, living tissues. Mark the word *healthy!* It is not at all improbable but that there are conditions of the body, rare, indeed, and ill understood, in which clouds, as it were, of bacteria pass through the circulation. If there be no determining influence, these escape from the body, or are killed within it, without doing any harm. A bruise, a wound, or other *locus minoris resistentiæ*, is, however, sufficient to arrest their course and enable them to cause suppuration or other diseases. As I proceed, some evidence will be brought in support of this hypothesis; but at present I merely wish to draw attention to the importance of the qualification "healthy." Later it will be seen how careful we are to avoid any operations, except those of strict necessity, upon patients who are not in perfect health.

Under ordinary circumstances death is followed by decomposition with such certainty that it is hard to think of these changes apart from one another. It is most important, however, to realise that decomposition does not follow in the footsteps of death, whether it be of the whole body or of a part, unless bacteria are present and able to act. But bacteria are so universal that they attack all dead tissues which are suitable food for them, unless their action is prevented. The bacteria of putrefaction are so universal that their absence from normal dead tissues may be taken as indicative of the absence of other kinds. I use the words normal tissues, to exclude such as contain tubercle, actinomyces, and other organisms of the same kind.

* Hauser, in an able monograph ("Ueber das Vorkommen von Mikro-organismen in lebenden Gewebe gesunder Thiere. Archiv für Experimentelle Pathologie und Pharmakologie, 1886," vol. xx., p. 162), gives many references to the literature of this important subject.

Putrefaction of albumenous materials was originally thought to be due to a microbe which was called by Cohn the bacterium termo. Hauser* differentiated the bacterium termo into three species, which he named proteus vulgaris, proteus mirabilis, and proteus Zenkeri. He says that these bacteria cause decomposition of wound secretions, mortification of tissues, and toxic phenomena of greater or less severity. † They are pathognic for rabbits and guinea-pigs. Hauser ‡ gave rather massive subcutaneous injections, and produced locally inflammation, œdema, suppuration, and necrosis. After death the internal organs showed no signs of disease, but proteus vulgaris was recovered in pure culture from the peritoneal effusion of a guinea-pig. Cultures of proteus vulgaris and of proteus mirabilis which had been sterilised by filtration caused a rapidly fatal result when injected into the venous system (a true sapræmia). Two facts seem to stand out from Hauser's work, namely, that he used very large doses of his cultures, and that no alterations were seen in the internal organs. An examination of the blood and of the tissues by modern bateriological methods does not seem to have been made.

To test the sterility of small organs, tissues, bits of skin, sponges, towels, silk, fluids, discharges, or substances from wounds, or other materials, transparent fluid culture media are most convenient and speedy. They are more easily prepared than the transparent solid media, and, I believe, give more reliable results. The following are the ingredients of Hüppe's broth, which is one of the more easily-made kinds.§ Boiled water, 1 litre; pepton powder, 5 grammes; grape or cane sugar, 5 grammes; extract of meat, 30 grammes. These are to be mixed together in a glass beaker (with a cover to prevent the unnecessary entrance of dust) and boiled over a gas-burner or spirit lamp. Whilst boiling, the mixture should be neutralised with a few drops of a solution of carbonate of soda. This should be added until the litmus paper begins to turn blue. After having been boiled for a quarter of an hour, the fluid should be filtered until quite clear, and then decanted into clean and sterile test-tubes, until they are filled for about two inches of their depth. These are then plugged with sterilised cotton-wool, which prevents the entrance of bacteria, and the whole sterilised by steaming for half-an-hour upon, at least, four consecutive days. The first boiling kills the cocci and bacilli, the subsequent ones kill the several swarms of bacilli which have germinated from spores, before they have time to develop fresh spores. The sterility of these tubes ought to be tested by keeping them for a few days in an incubator at the temperature of the human body.

* "Ueber Fäulniss Bacterien und deren Beziehungen zur Septicæmie." Leipzig. 1885. P. 12, *et seq.*

† Loc. cit., p. 76, *et seq.*

‡ P. 76, *et seq.*

§ "Micro-Organisms and Disease." Klein (third edition, 1886), gives explicit directions for preparing culture media.

The transparent solid culture media are troublesome to make, and can now be obtained without difficulty from a number of manufacturers. Goffi, Dr. Klein's laboratory assistant, is good enough to supply me with all the media I require. They are required for the correct diagnosis of the kinds of bacteria which may have grown in the broth.* Roughly speaking, broth will tell in twenty-four or forty-eight hours whether anything is septic. It is, however, necessary to wait much longer before it is safe to assert that anything is aseptic. Sometimes so few bacteria are present in the substance which is being tested that some days are required for their multiplication.

The culture tube of broth, gelatin, or agar-agar is used in the following way:—The assistant sterilises a pair of ordinary dressing forceps in the flame of a spirit lamp or Bunsen's burner; then he holds the mouth of the test tube which he is about to open, in the flame until the projecting part of the wool plug, and all of its mouth, are thoroughly sterilised. Next, holding the test tube at a slight obliquity, to prevent dust and bacteria falling into it from the air, he rotates and withdraws the plug with the sterilised forceps, presents the tube to the operator, who puts the material into it with sterilised instruments, and, finally, disinfects the plug in the flame, and thrusts it back into the test tube. The tube is then placed in an incubator, which is usually kept at a temperature of 75° F. (summer temperature). The various departments at St. Bartholomew's now contain incubators, so that anyone can practise for himself. But those who are not near such accommodation will find one of Hearson's incubators easy to manage, and reliable. Many bacteria will grow in a warm room, and I should think a conservatory or greenhouse would be a good place, if an incubator could not be obtained. Everyone ought to do some experiments of this kind. At first the experimenter will be humiliated by his failures, but afterwards his standard of perfection will be extraordinarily raised. Everyone, too, who has the opportunity ought to attend Dr. Kanthack's lectures and demonstrations upon bacteriology. Such knowledge as he imparts is as important in surgery as a knowledge of anatomy, physiology, and pathology.

(*To be continued.*)

* For the diagnosis of Bacteria, Eisenburg's "Bakteriologische Diagnostik," published by Voss of Hamburg, third edition, 1891, is almost indispensable. It has been translated into English.

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Chronic Laryngeal Obstruction following Diphtheria.

By H. J. WARING, M.S., B.Sc., F.R.C.S.

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IT occasionally happens in patients who have suffered from diphtheria, and upon whom on this account the operation of tracheotomy has been performed, that considerable difficulty is experienced in respiration when the trachotomy cannula has been removed. Very rarely it is found impossible to leave off the use of the cannula. When this condition occurs there is generally some obstruction to the free passage of the inspired air in the lower part of the larynx or upper portion of the trachea. This obstruction takes the form of exuberant granulations, which, springing from the mucous membrane, partially or completely fill the lumen of the respiratory tube. This growth of granulation appears to occasionally follow an attack of laryngeal diphtheria which has extended to the mucous membrane lining the upper portion of the trachea. After the membrane has separated and been coughed up, a raw surface is left, which, instead of becoming covered with normal epithelium, becomes the seat of granulations which grow inwards, and ultimately, partially or completely, block the air passage. These granulations appear to be larger and more exuberant in that portion of the larynx which lies below the true vocal cords. The direct exciting cause of this exuberant growth is not very apparent. Probably extensive ulceration of the laryngeal mucous membrane, after separation of the diphtheritic false membrane, is a predisposing cause, and the accumulation of secretions and pieces of membrane in the space below the vocal cords and above the tracheal cannula, may act as an exciting cause. In whatever way this obstruction has been brought about, when present it gives rise to much inconvenience and disappointment. The following is a case of this kind.

"David A. aged 8, was admitted to the hospital on May 25, 1890, suffering from diphtheria, and immediately afterwards the ordinary operation of tracheotomy was performed. The patient recovered from diphtheria, but although many attempts were made to leave off the tube, each time after its removal difficulty in breathing was experienced and the tube was replaced. On one occasion the tracheotomy wound was enlarged. This condition remained permanent until June 17, 1891, when the boy was admitted into a surgical ward. On laryngoscopic examination the larynx below the true vocal cords appeared to be occluded with exuberant red granulations. During respiration no air passed through the larynx, on its way to the lungs. On June 21, the old tracheotomy wound was enlarged upwards, the first ring of the trachea and the cricoid cartilage being cut through. The lower portion of the larynx appeared to be entirely closed with granulations. These were scraped away with a small Volkman's spoon, and in this way the lumen of the respiratory passage was restored at the obstructed part. A medium-sized O'Dwyer's intubation tube was now introduced through the mouth into the larynx, so that the flange of the tube rested upon the vocal cords, and the lower portion extended through the lower part of the larynx into the trachea, the lower extremity being below the original tracheotomy aperture. After a certain amount of mucus and blood had been coughed up, the breathing through the tube was quite free. No air passed through the wound after recovery from the anæsthetic, the patient remained quiet, the tube being easily retained.

"June 22.—Patient comfortable. No pain on account of tube. Slight cough. Fluid food taken with some difficulty.

"June 23.—Tube still retained. Takes milk, but act of swallowing caused some cough.

"The tube was kept in for three weeks when it was coughed up. At this time the tracheotomy wound had entirely healed, and the boy breathed freely, the air passing along the normal passage. A few days afterwards difficulty in breathing was again experienced, and the intubation tube was re-inserted, and allowed to remain for some days. After several intubations, lasting altogether over a period of more than two months, the use of the tube was entirely discontinued, and the boy was discharged. The voice was somewhat feeble and hoarse, but showed a gradual improvement. The boy has been seen and heard of several times since his discharge from the hospital, and has continued well, no further difficulty in breathing being experienced.

The success which followed the use of intubation tubes in the above-cited case, points to their value in the treatment of chronic laryngeal stenosis or obstruction which has followed an attack of laryngeal diphtheria. These tubes have been used to a considerable extent in America in the treatment of the acute stages of diphtheria. In these cases, however, it is very doubtful whether they are an improvement upon the ordinary method of tracheotomy; since often it has been found necessary to resort to tracheotomy after intubation has been performed. It appears to be quite possible that they may act as a means of promoting the spread of the diphtheritic process from the larynx to the trachea.

In cases of chronic laryngeal obstruction or stenosis which occasionally follows diphtheritic attacks, and in which it is found impossible to dispense with the use of the tracheal cannula, they offer an easy and ready means of restoring the air passage to its normal condition. In old-standing and severe cases like the above, it will be necessary to divide the cricoid cartilage and scrape away the exuberant granulations, but in early cases this procedure will scarcely be necessary, since the continued pressure of the intubation tube will cause them to atrophy.

[For permission to make use of the above case I am indebted to Mr. Langton, in whose ward the case was treated when I was his house-surgeon, and for this I beg to offer him my thanks.]

Diphtheritic Sore Throat.

A Paper read before the Abernethian Society by

J. A. HAYWARD, M.D., M.R.C.P.

PART I.

(*Continued from page* 163.)

I MUST now briefly refer to the important results which Dr. Klein has obtained in his experiments with the diphtheria bacillus.

In his first series of experiments with a bacillus which was obtained from diphtheritic membrane, and which answered in all respects to that described by Klebs and Loffler, he was quite unable to confirm the results of these observers; but with another bacillus obtained from the same membranes, and differing from

the Klebs-Loffler bacillus in morphological characters, and also in the fact that it grew on gelatine at a temperature of 20° C., he produced a very remarkable specific inflammation by inoculating it on the cornea and conjunctiva of cats.

The inflammatory products were capable of inducing a similar condition on the cornea of other cats, and, microscopically, showed a bacillus which was smaller than the Klebs-Loffler, and which also differed from it, in that Klein's bacillus would grow readily on gelatine at a temperature of 20° C.

Continuing his experiments, he pointed out that from diphtheritic membranes two varieties of bacilli could be frequently separated. One of these was identical with the bacillus he obtained from the corneal inflammatory products in cats; the other answered to the description of the Klebs-Loffler bacillus. The former, which he regarded as the true diphtheria bacillus, differs from the latter or pseudo-bacillus, in that it grows more quickly in broth, grows on gelatine, and the cultures remain active for many months. Moreover the true bacillus grows in milk at a temperature of 20° C., and the pseudo-bacillus does not grow at all under the same conditions.

Finally, out of 22 cases of human Diphtheria examined, the true bacillus was found in every instance and separated pure, the pseudo-bacillus only in 12 cases.

Klein having isolated what he regarded as the true bacillus repeated his experiments on guinea pigs and other animals, and this time with positive results. He found that the inoculation of a small quantity, ¼ to ½ c.c., of a pure cultivation in broth, gave rise at the seat of inoculation within twenty-four hours to a necrotic swelling, the animals dying within forty-eight hours with profound muscular weakness and great rapidity of respiration. With less virulent material obtained from agar cultures death was postponed, and in many of these cases paralysis of the limbs ensued. After death pure cultivation of the bacillus could be obtained from the local tumours; no organisms were found in the other tissues, but frequently the lungs were congested, and fatty degeneration of the liver and kidney was present.

Further experiments were directed to the elucidation of two very important facts which had previously been noticed, and which have important bearings on the etiology of Diphtheria in the human subject.

The first fact is, that concurrently with epidemics of Diphtheria, cats have in certain instances been noticed to suffer in the localities where Diphtheria was prevalent from an epidemic and fatal disease. The symptoms begin with sneezing, coryza, cough; difficulty in breathing and swallowing frequently follow; the animal loses its appetite, emaciates, its coat becomes rough, muscular weakness supervenes, and death often takes place within a fortnight or three weeks.

When examined after death, the lungs of the cats are found invariably to present patches of pneumonic consolidation, with minute hæmorrhages; a thin membrane is often found in the trachea and bronchi; the liver presents dark necrotic areas, and the cortex of the kidneys shows marked fatty degeneration.

Now, Klein experimented on cats by injecting cultures derived from human diphtheritic membrane, and produced an exactly similar disease, and with the same post-mortem appearances.

Again, by injecting virulent cultures into the trachea, he induced the formation of membrane and of pneumonic areas in the lungs, which, examined by microscope, revealed abundant diptheria bacilli, and from which pure cultures could be obtained.

Once more, by feeding cats with milk, which had previously been mixed with pure cultures of the bacillus, similar symptoms and post-mortem appearances were produced.

It can hardly be doubted then that this epidemic disease of cats is due to the same bacillus as is Diphtheria in the human subject, and indeed, several instances have been recorded where cats have become infected from human beings, and *vice versa*.

To quote one striking instance. At Enfield, in the year 1888, a little boy had a fatal attack of Diphtheria. On the first day of his illness he vomited, and the cat of the house eager, no doubt, for novel epicurean delights, licked the vomit as it lay on the floor. In a few days, and after the death of the boy, the cat was noticed to be ill, and her sufferings being severe the owner had her destroyed. During the early part of its illness this cat was let out in the back yard. A few days later a neighbour's cat with whom, doubtless, terms of intimacy had existed, was noticed to be ill. This cat also had been out in the back yard at night. However, this second cat recovered, being carefully nursed by four little girls, all of whom later developed the disease. No other source of infection could be traced.

The second fact which Klein investigated related to the conveyance of the infection in milk.

Well-known epidemics definitely ascertained to have originated in this way, have occurred, among other places, at Camberley, Croydon, and Bishop's Stortford. In both the Croydon and Bishop's Stortford epidemics, it was found that certain cows from the dairy which supplied the milk were suffering from a contagious ulcerative eruption on their teats and udders, which presented certain definite characters.

Klein, experimenting on cows by inoculation with virulent cultures of the bacillus derived from human membrane, was able to induce a disease in cows and calves attended by a definite train of symptoms.

Briefly: a local tumour was produced at the seat of inoculation from which the bacilli could be recovered. The cows suffered from loss of appetite and cough. The temperature was raised, and death, preceded by great muscular prostration, ensued in certain of the cases. In four cases an ulcerative eruption occurred in the teats and udders, precisely similar to that which had been observed in the Croydon and Bishop's Stortford cows.

After death no bacilli were found in the internal organs, but they could be recovered from the local tumour and cultivated pure; and injections into guinea pigs of these bacilli gave identical results with other injections made from bacilli obtained from human diphtheritic membrane. Moreover, bacilli were obtained, during life, from the milk of these cows. All sources of contamination during the process of milking being carefully guarded against.

Thus far, then, we see that these experiments on animals afford proof that the bacillus is the true cause of Diphtheria. For—

1st. The bacillus can be separated from human diphtheritic membrane and grown outside the body in pure culture.

2nd. Injection into animals of these cultures produces a disease which resembles in the main Diphtheria in the human subject; and is especially characterised by lesions in the lungs and kidneys, in itself a suggestive fact, inasmuch as broncho-pneumonia and albuminuria are common in the human disease; and again, in protracted cases paralysis ensues in animals exactly resembling ordinary human diphtheritic paralysis.

3rd. From the local seat of inoculation the bacilli can again be separated and grown in pure cultivation, and these are found to possess the same properties as the original cultures from the human membrane.

Also, as I have already mentioned, it would seem certain that during the life history of the bacillus in the tissues, or in culture media, some subtle poison is produced which absorbed into the system produces the characteristic features of the disease.

Now Dr. Sydney Martin has lately conducted important investigations as to the nature and mode of production of these poisonous products which are formed by the agency of the bacilli.

His method consisted in a chemical examination of:—

1st. The tissues of human subjects who had died from Diphtheria.

2nd. The diphtheritic membrane itself.

3rd. The products formed in culture media.

It would be hardly profitable to relate the complicated processes adopted, expecially as they may be found in the Local Government Reports for 1891.

It will be sufficient for my purpose to mention that in eight cases he was able to separate from the tissues of patients, who had died from Diphtheria, a small quantity of a toxic albumose, which resembled, by chemical tests, the ordinary peptic albumoses.

The spleen was found to contain the greatest amount. Present with these albumoses an organic acid was found in very minute quantity. Injection of this albumose into guinea pigs and rabbits was made, both subcutaneously and into the veins, in single and in multiple dose.

In subcutaneous injection, in single dose, local œdema was produced at the seat of inoculation, and an irregular rise of temperature.

In intravenous injection of ·122 grammes per kilo. of body weight, death ensued in three hours with fall of temperature, weakness of the hind limbs appearing in one hour and a-half. Intravenous injection in small quantities when repeated from day to-day gave rise to—rise of temperature, a general and progressive paresis of the muscles of the trunk and limbs, loss of weight, diminished knee-jerk, and sometimes diarrhœa. Rapid respiration preceded death, which occurred sooner or later in proportion to the strength and frequency of the injections.

In those animals in which paralysis had ensued before death, careful post-mortem investigation revealed no noteworthy microscopic changes in the internal organs.

A careful microscopic examination was made of nerve-trunks from various parts of the body and of their terminal filaments, by teasing out the fibres and staining with osmic acid and carmine. The spinal cord and medulla were also examined.

Remarkable changes were found in many of the terminal nerve-filaments; marked degeneration of the white substance of Schwann, with rupture of the axis-cylinders was found in many of the fibrils, different branches being affected in different degrees, so that in the same nerve-trunk healthy fibres were found side by side with others that were diseased.

These nerve changes were found without exception in all the animals experimented upon and in various situations—the nerves of the orbit and palate, the phrenics, muscular and sensory trunks in the limbs, and the pneumogastrics.

Associated with these changes, fatty degeneration and loss of striation were observed in many of the muscles, especially the heart; the changes here, as in the nerves, affecting different fibres of the same muscle in different degrees.

Special investigation was now made in the same direction in human subjects who had died of Diphtheria, or from subsequent paralysis, and the nerves and muscles in these were found to present changes identical with those which had been produced experimentally in animals.

Further proof can hardly be needed that these albumoses found in the tissues after death, and the nerve and muscle degeneration in animals, and in patients who had died from Diphtheria, stand in the relation of cause and effect.

From human diphtheritic membrane Sidney Martin has further extracted albumoses in different stages of digestion, and corresponding to the stages which are found in the peptic digestion of proteids. He found, moreover, that the extract of the *membrane* caused fatal results in far smaller doses than the albumoses which he had obtained from the tissues; that it was also capable of attenuation by heating, and that boiling destroyed its poisonous properties.

Roux and Yersin have obtained the same results from extracts made from artificial cultivations in broth.

These extracts when injected in exceedingly minute doses produce the same paralysis and nerve and muscle changes as the albumoses obtained from the organs of those who had died of Diphtheria.

For explanation of these results it is inferred that during the growth of the bacillus in suitable soil a specific ferment is produced which, absorbed into the system, has the property of digesting the proteids of the body. In the process of digestion the proteids are split up, and among other products a toxic albumose, and an organic acid are formed, which can be recovered from the tissues.

Martin points out how this process may be considered as analogous to what ordinarily goes on in the body in normal peptic digestion of proteids. In peptic digestion as primary agent there is the living peptic cell, which corresponds to the living bacillus. Both give rise to the secondary agent — in the one case the ferment pepsin, in the other case the diphtheritic ferment—and as the result of the action of this ferment on proteids we have, in the case of peptic digestion, certain albumoses, acid albumin and peptone; in the case of the diphtheritic ferment we have certain albumoses and an organic acid.

In the light of these experimental investigations we seem to have, in the case of Diphtheria, a more complete knowledge of its intimate pathology than in almost any other infective disease; but in regard to its etiology, the natural history of the specific organism outside the body, and the conditions which favour or are inimical to its existence and growth, we are still groping in darkness.

In this etiological puzzle certain well-ascertained facts stand out prominently, but whether it is that their arrangement and mutual relations have not yet been properly determined, or, as is more probable, many of the pieces are still wanting, it is certain that the picture is still incomplete.

We know that of late years the mortality from Diphtheria has greatly increased (this may be partly, but not wholly accounted for by a wider recognition of the disease), and this in the face of improved sanitary conditions which have caused a decrease in the mortality from the other infectious diseases.

The relation of Diphtheria to defective drainage, sewer gas, and impure water supply, overcowding, and general defective hygienic surroundings is still *sub judice*. There are many who contend that the disease may originate, *de novo*, under certain conditions, and support their contention by innumerable and almost convincing instances, where the disease has shown itself suddenly in isolated situations, and where no pre-existing source of infection can be traced.

Our knowledge is still insufficient to account for these cases satisfactorily; but of one thing we may be certain, that if, as seems clear, the true cause is a specific micro-organism, then this micro-organism must have had not only a parent but a line of ancestors from whom it has inherited its specific properties, and if we are unable to trace the descent, and lay our hands upon the title-deeds by which they claim and have obtained possession of our drains, or our meat and drink, then we must attribute the failure to our own carelessness or lack of acumen, rather than consider that there has been any interruption in the laws of Nature.

This is quite apart from the question whether the organism is invariably pathogenic. It may be that certain pre-existing conditions are necessary before it can assume this rôle, and, indeed, most observers agree that the inoculation of the bacillus on healthy mucous membrane is productive of no result.

It may be that it requires the co-operation of other micro-organisms, although this idea is somewhat negatived by the very positive results which have been obtained in working with pure cultivations. None the less, however, may the mucous surfaces be prepared, so to speak, for the bacillus by the influence of other micro-organisms, as is probably the case in scarlatina, acute tonsillitis, and in the forms of sore throat, which are induced by inhalation of impure air, whereby pathological changes are induced, which may be the necessary preliminaries for the specific action of the diphtheria bacillus.

Indeed, as regards the pseudo-diphtheria bacillus, some observers have considered that it differs from the true bacillus only in degree of virulence; that the difference is one of degree only, and not one of kind, and that the pseudo-bacillus is really only the organism undergoing a kind of saprophytic phase, which is interpolated in the life of the virulent or true bacillus. It is certain that the specific properties of the bacillus diphtheriæ vary under different conditions. Thus, when grown on agar, it is found to lose much of its virulence, and it has often been observed in epidemics, that cases vary both in severity and in infective properties.

Over and over again have mild forms of sore throat become gradually severer in type until at last genuine diphtheria is recognised, and so frequently has this occurred, that Dr. Thorne-Thorne, in his Milroy lectures, lays considerable stress on what he calls the progressive development of the property of infectiveness observed in those cases of sore throat, which precede a recognised outbreak of diphtheria.

Till lately it has been impossible to recognise such early cases as genuinely diphtheritic in nature. The diagnosis, if made, has at best been only a probability, and has been influenced not by any particular appearance of the angina, but by concomitant symptoms, and the prevalence of other cases of sore throat.

Again, how often do we see cases in which a more or less coherent layer of membranous exudation covers the tonsils, and when the diagnosis at first is doubtful, between scarlet fever, Diphtheria, or a severe follicular tonsillitis, and is not finally cleared up till the course of the disease reveals its nature.

Or, again, in genuine scarlet fever the appearance of definite membrane on the palate, or tonsils, may lead to the suspicion that there is a concurrent infection of Diphtheria; or, again, a simple non-membranous angina which has been regarded as innocent in type till subsequent paralysis reveals what has been its true nature.

It is all very well for the books to describe the type of angina met with in scarlatina, catarrhal, and diphtheritic cases, and to lay stress on the hardness and swelling of the glands, of albumen in the urine, and of the type of the pyrexia, and other differences in the constitutional symptoms—the fact remains that in very many cases we are quite unable from the appearance of the throat to tell the nature of the malady, and the accompanying symptoms present at the time of an inspection fail to help us just when their aid is most needed; and, indeed, it is only what we should expect to be the case if Diphtheria is especially prone to become engrafted on a mucous membrane already damaged by some pre-existing morbid condition.

It would appear, then, that although each particular disease is manifested as a rule by a certain type of sore throat, yet a scientific classification from anatomical appearances alone is altogether unsatisfactory, and from a clinical standpoint is misleading, partly from the fact that these types merge gradually one into the other, and especially because they may each occur in different diseases.

We must, in fact, as I have already said, consider catarrhal, croupous, or diphtheritic inflammation of the fauces as indicative rather of a pathological condition, which may occur from various causes, than as clinical entities, synonymous with catarrh, croup, and Diphtheria, and while we recognise the fact that by far the commonest cause of so-called diphtheritic membrane in the fauces is Diphtheria, yet it is unsafe to argue that because it is absent we can necessarily exclude Diphtheria, or, when it is present, that the condition is pathognomonic.

The point which I wish to insist upon is, that in all cases of doubt, an investigation should be made as to the presence or absence of the bacillus diphtheriæ, and this examination should hold as important a place in diagnosis, as the demonstration of Koch's bacillus in tuberculosis. Here, then, is a new labour to be undertaken by the already overburdened clinical physician, and the question arises,—where are we to stop?

Certain it is that a physician of any repute, nowadays, cannot rest content with the means of diagnosis which were alone available to an older generation. It is now essential that he should use the ophthalmoscope and laryngoscope; investigate the condition of the blood with microscope, hæmocytometer, and hæmoglobinometer; be able to use the battery in testing the condition of the muscles and nerves, and able

to analyse the urine far more accurately than is necessary for the mere determination of the specific gravity, the reaction, and the presence of albumen and sugar.

Are bacteriological investigations, as a means of diagnosis, to be added to this already extensive repertoire of means to end, or must the physician have recourse for the refinements of his art to the surgeon, ophthalmologist, laryngologist, electrician, chemist, bacteriologist.

This is a question far too large to enter upon to-night, but as regards bacteriology, at least, it seems to me, that the clinical physician should be able to make use of those methods, which perfected by the bacteriologist in his laboratory, are brought within the reach of all who are willing to spend a certain amount of time and trouble in acquiring them: and this must be my excuse to-night for any encroachment on a subject which may be considered as the exclusive monopoly of the bacteriologist.

Williams' Statistics.—Dr. Williams, of Boston, was the first, as far as I know, to establish a systematic examination of the throat in a fever hospital in all cases of membranous exudation on the fauces. His paper on membranous throat affections is well worth reading; his methods seem sound, and his conclusions do not seem to require the customary grain of salt, which is often necesary to the digestion of papers emanating from our cousin Jonathan. He divides his cases into—Diphtheria, in which the presence of the Klebs-Loffler bacillus was found by microscope and culturally; Diphtheria and scarlet fever; pseudo-diphtheria (in which no bacilli were found); pseudo-diphtheria and scarlet fever; tonsillitis; and his results bear out what I have mentioned to-night, that the presence or absence of so called diphtheritic membrane is not in itself pathognomonic of true Diphtheria. He points out the frequent coincidence of scarlet fever with cases of membranous sore throat, many of which are true Diphtheria, also with measles, and in one case with typhoid fever; in both the latter true bacilli were found.

Further, before leaving the hospital another examination was made to prove the absence of the bacillus from the throat.

He insists upon—

1st. The necessity of cultures as a means of diagnosis.

2nd. The coincidence of Diphtheria and other diseases.

3rd. The bacteriological examination of all patients ill with scarlet fever, measles, and other diseases, who have membranous throats.

4th. The examination again before isolation is ended.

Treatment.—Time prevents me from saying all that I should like in regard to treatment, and I trust that in the discussion to follow this the most important of all questions may be more adequately dealt with.

As regards prophylaxis, measures must be taken in accordance with the little we know about the natural history of the disease and its mode of propagation.

And, firstly.—The disease is most prevalent in the fall of the year, from October to December.

Secondly.—That though its relation to insanitary conditions in general and defective drainage in particular, is not yet satisfactorily made out, yet the combination of rapid variations in the level of the subsoil water, with dampness of locality, and insufficent light and air, seems to favour the harbouring and activity of the specific micro-organism.

Thirdly.—Its special proclivity for children.

Fourthly.—Its intimate relation with other forms of angina, the presence of which so often precedes its incidence.

Fifthly.—The agency of milk as a medium for conveying the contagion.

Sixthly.—The occurrence of certain definite diseases in animals, cows, cats, poultry and other birds, from which genuine Diphtheria may be derived as known in the human subject.

As regards its mode of propagation:—

1st. The fact that direct infection from discharges from the mucous membrane of the air passages are probably the commonest channels of infection.

2nd. The fact that the vitality of the organisms is long preserved.

3rd. That the disease is very frequently kept up and propagated by means of school attendance, where overcrowding is frequent, and opportunities for direct infection are constantly occurring, &c.

To counteract these:—

The removal of insanitary conditions which may give rise to sore throat, and thus act as a predisposing cause for the specific infection.

The proper drainage of the subsoil in damp localities, and abundant supply of light and air.

The boiling of milk before use.

The destruction of animals when there is reason to suppose that they are suffering from a diphtheritic malady.

Notification.

The isolation of patients in wards reserved especially for diphtheria cases.

A more thorough medical supervision of Board schools.

The thorough disinfection or destruction of all articles contaminated by patients, and of their excreta. A bacteriological examination of the throat to be made before the patient is pronounced free from infection, and, if not too utopian an idea, the hope that a more educated public opinion may one day sanction the cremation rather than burial of the bodies of patients who have died of infectious diseases.

With regard to any idea of preventive inoculation, I can only say that in diphtheria Frœnkel's experiments show the partial immunity obtained in guinea pigs by injecting small doses of cultures which had been attenuated by heating to 65°C. was not lasting, and it did not render the animal insusceptible if more than one dose of virulent culture were injected.

No specific is yet known to counteract the poison after it has been absorbed into the system, and here again we must await further researches from the laboratory to indicate the lines on which such therapeutic effect may be obtained.

The one hold that we seem to have on the disease, after its incidence, is by well-directed local treatment to destroy the "fons et origi mali."

At the seat of inoculation there is established a local poison manufactory. The poison once distributed we have at present no means of counteracting its influence. Our only method is to destroy as far as possible the raw material products, and the operators.

The various remedies recommended are legion, a sure sign that no particular one has been found perfectly efficacious. It would be barely profitable even to enumerate those that have found highest favour, and, as Mr. Parker says in his admirable little treatise, "that given an efficient antiseptic the proper application of the remedy is of more importance than its selection."

Carbolic acid, perchloride of mercury, boracic acid, Condy's fluid, resorcin, chlorine water, chlorinated soda, lime water, borax, carbonate of soda, insufflation of sulphur, caustics, such as nitrate of silver, frequent spraying, gargles, direct swabbing, insufflation of powder, all have their advocates.

The conditions which any really efficient application must fulfil are:—

1st. That it should kill quickly the specific bacillus, or, at least, inhibit its growth.

2nd. That if possible its action should not be poisonous.

3rd. To dissolve or dissipate the membrane, as soon as it is found, thus cutting off nutrient supplies to the organism, and rendering it more accessible to the remedy.

4th. That the mode of application should be easy, and accompanied by a minimum of discomfort to the patient.

The great obstacle in the way of efficient local treatment is of course the difficulty in making applications to the back of the throat in such a way that the antiseptic shall be brought into immediate contact with the bacilli. The surfaces are complicated and the region sensitive, a really good view is seldom obtained, and all manipulation must necessarily be of short duration. Add to this that the bacilli are enclosed in tough membrane, which is further often protected by a layer of mucus, and the difficulties will be seen to be almost insuperable. In most cases nothing that seems really radical can be done without causing an amount of distress to the patient which would be quite unjustifiable in a disease in which heart failure and exhaustion are among the most prominent of the dangers to be guarded against. All these difficulties are necessarily increased in children, who are especially subject to the disease.

The only rational way of treatment appears to me to remove, if possible, the membrane, and to prevent its forming again in such masses as will prevent the efficient application of local treatment. At the same time, if the membrane is tightly adherent no force must be used in its removal, which would impair the vitality of the part or abrade any further areas of the mucous membrane.

At the first sitting the throat should be swabbed out thoroughly with a small tampon of cotton wool soaked in the antiseptic, held in forceps or wound round some form of holder. If necessary, the throat may be sprayed previously with a ten per cent. solution of cocaine to render the parts less sensitive; or, if the case is still early and the strength good, I would even recommend the administration of an anæsthetic if the patient is a child and very recalcitrant.

The swabbing will probably clear away all membrane which is not tightly adherent, and will remove the viscid mucus.

Afterwards, and at intervals of not less than every three or four hours, a spray should be used, in which the antiseptic must be combined with lime water, papain, or other solvent; and I can see no harm at least in his drinking or sipping slowly, if he likes it, the common chlorine mixture, if it does not interfere with the administration of proper nourishment.

The swabbing should be repeated every day as long as membrane is present, and the spray as before. It is no good applying these

remedies in a desultory way, and in a child half the difficulty will be obviated, and less strength lost, if only sufficient hands are employed. The head should be held by one assistant, another should control the body and limbs, and the operator should confine his attention to the manipulation with spatula and swab.

With regard to choice of antiseptics, an ideal one is still to be found. Peroxide of hydrogen in acid solution, and of 20-30 volume strength, has lately been highly recommended; it is stated to loosen and dissolve the membrane, and kills the bacilli more readily than perchloride of mercury. The nascent oxygen which is given off is the efficient agent.

In conclusion, I must say that I am very conscious of the defects of this paper, arising not only from the difficulty of having a clear conception in my own mind of the pathology and relations of the different forms of sore throat, but also of stating in a clear and yet concise way the very nature of these difficulties so that they may be intelligible to others. I can only hope the more apparent are the deficiencies of the introduction, the more enlightened may be the subsequent discussion, and if so, paradox as it may seem, there may be merit wherein I have most failed.

Notes.

THE following changes in regulations of the Conjoint Board have been announced:—(1) That candidates who are referred at the first examination in Chemistry and Physics, must, on presenting themselves for re-examination, produce a certificate of further instruction for not less than three months. (2) That attendance on a Course of Demonstrations at a Lunatic Asylum may be taken at any time after passing the Second Examination.

* * *

IT is announced that an Ophthalmic Surgeon to the Hospital, *vice* Mr. Henry Power, F.R.C.S., M.B., resigned, will be elected at a Court of Governors, to be held on September 27th next.

* * *

MR. HENRY POWER has been appointed Consulting Ophthalmic Surgeon to the Hospital.

* * *

ONLY a few months ago we commented upon the frivolous action for malpraxis which was most unjustifiably brought against a respected "old Bart.'s man," Dr. Tait, of Highbury; and we have now to record another case in which a Bart.'s man was engaged in litigation with a patient. We refer to the action for slander brought by Dr. Frederick Thorne, of Leamington, against Mr. C. T. Richardson, a retired Indian planter. Mr. Richardson met with an accident in the hunting-field, which resulted in a fracture of the clavicle. This was treated by Dr. Thorne in a perfectly correct manner, but the patient became irritable, and would not submit to the proper bandages, whereupon Dr. Thorne quite rightly declined further responsibility. Subsequently it appears the patient spoke in disparaging terms of Dr. Thorne to several of his patients, and Dr. Thorne brought an action, in the course of which the evidence showed conclusively that the doctor had treated the patient in a perfectly proper manner, and damages for the slander were awarded to Dr. Thorne to the amount of £25. We congratulate Dr. Thorne on having taken the case into court, and on the very proper way in which he has vindicated, not only his own position, but also the honour of the profession.

* * *

AMONGST the successful candidates for commissions in the Indian Medical Service, we note the name of Mr. A. F. Stevens, L.R.C.P., M.R.C.S., who has obtained the fourth place in order of merit with 2,500 marks.

* * *

THE following have been admitted Diplomates in Public Health at the Royal Colleges of Physicians and Surgeons:—D. N. Cooper, M.R.C.S., L.R.C.P., W. A. Dow, M.B., B.S. (Dur.), M.R.C.S., L.R.C.P., S. Shore-Smith, M.R.C.S., L.R.C.P., and J. Williamson, M.B. (Lond.), M.R.C.S., L.R.C.P.

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AT the final L.S.A., the following have passed:—In Forensic Medicine, F. E. A. Webb; in Midwifery, G. Lowsley and F. C. Sutherland.

* * *

THE results of the Preliminary Scientific Examination at the University of London are fairly satifactory. Twenty-one Bart.'s men have passed. S. R. Scott and F. C. Borrow have obtained honours in Zoology; J. M. Collyns and L. A. Walker are in the 1st Division; H. Burrows, W. S. Danks, G. H. Low, A. R. Roche, and C. S. Scott are in the 2nd Division. C. S. Frost, though failing to obtain Honours, is recommended for a pass. In Chemistry and Physics, N. H. Joy, J. J. S. Scrase, and R. E. H. Woodforde have passed, and N. C. Beaumont, C. R. Brown, W. P. Dyer, J. S. Gayner, S. B. Green, A. H. Hayes, J. Hyland, and A. L. Vaughan have been successful in Biology.

* * *

A House-Physician standing in the Square the other day, was thus accosted by a somewhat seedy-looking individual. "Please can you tell me where 'Adyn's pictures are?" It appeared that the man wanted to see Hogarth's "Pool of Bethesda," and "Good Samaritan," on the staircase of the Great Hall.

Abernethian Society.

The inaugural address of the Abernethian Society will be delivered on THURSDAY, OCT. 11th, AT 8 O'CLOCK, by Sir James Paget "On Scientific Study in the Practice of Medicine and Surgery." Freshmen are especially invited.

Rugby Football Prospects.

ALTHOUGH this year we are unable to use our new ground at Winchmore Hill, we hope to have a more than usually successful season. We are endeavouring to obtain a ground within easy reach of the hospital, in the hope of inducing men to practise during the week, for it is by practice alone that a powerful combination can be formed.

Of last year's team we lose fewer than usual, as we had so many first year's men playing. Our old captain is, unfortunately, out of his year, and we also lose the valuable assistance of Messrs. Martin and Stevens; however, we are glad to hear of many new men of whom much may be expected, and we are especially glad to welcome some three-quarters, who should make a great difference to us; of forwards we shall have a great choice, and there will be much competition to get into this division of the first fifteen.

The second fifteen, under Mr. Martin's able generalship, should be well to the fore.

Our match-card is better than usual, and of new fixtures we may mention Woolwich, United Services, and Northampton; there is also a very good chance of our meeting Edinburgh University on their own ground.

A few words of advice to the Freshmen may not be out of place here. Hospital football is not like school football; there are not so many opportunities for practice, and it is therefore necessary to seize all those that offer; hence a practice game should never be missed, and the Boxing Club should be well attended, with a view to the training it gives. If every member of the team went across to the club room twice a week during the winter session we should be much better off than we are now. It is important also that everyone should remember to "cross" his name on the team list as soon as possible, and thus save the Secretary (who has already an abundance of work to do in connection with the teams) a great deal of unnecessary trouble.

Lastly, every "Fresher" who intends to play this season should make point of playing in the trial game—a notice of which will appear on the notice board in due course.

Cases Worth Seeing.

MEDICAL.

Hope Ward, No. 17, F. æt. 54, paralysis and atrophy in all four limbs. ? Nature.
" No. 16, F. æt. 18, extensive thrombosis.
Luke Ward, No. 13, M. æt. 43, gout with extreme deformity from chalkstones.
Elizabeth Ward, No. 15, F. æt. 16, exophthalmic goitre.

SURGICAL.

Abernethy Ward, No. 17, malignant cyst.

Volunteer Medical Staff Corps.

THE Vol. M. S. C. encamped on Redan Hill, Aldershot, from August 4th to August 11th. The Provincial Companies from Maidstone, Leeds, Edinburgh, Glasgow, and Aberdeen joined the encampment, the total number encamped being nearly 450. No. 3 Company was under the command of Surg.-Lieut. Waring for the greater part of the time, Surg.-Captain Woodhead being only able to attend for the last three days. Twenty-seven members of the Bart.'s half Company attended, the greater part of whom went down on August 1st with the advance party.

THE drill, which was more exhaustive than usual, comprised company, stretcher, waggon and railway waggon drill, and formation of bearer company. The prize for Field Kitchen Digging was won by a squad of No. 3 under Lance-Corporal Meade.

THE field-day on Friday 10th was followed by a march past before the Duke of Connaught and Staff, in which the Corps acquitted itself very satisfactorily.

THE Corps Sports took place on Thursday 9th. Private Nunn won the Long Jump, and was second in the Hundred Yards. Private Dalzell was second in the Three Legged Race. Surg.-Captain Woodhead was second in the Officers' Race, Quarter-master Bennett being first and the Adjutant third.

Appointments.

DR. C. F. F. MURRELL, M.B., M.S. (Aberd.), M.R.C.S., L.S.A., to be Medical Officer of Health for Acton.

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MR. HERBERT W. MACLURE, M.B., B.C. (Cantab.), L.R.C.P., M.R.C.S., has been appointed, by the London County Council, Medical Officer to the Metropolitan Fire Brigade, District No. 6.

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MR. E. S. WINTER to be Junior House Surgeon to the Western General Dispensary.

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DR. P. S. ABRAHAM, B.Sc. (Lond.), M.D. (Dub.), to be Dermatologist to the West London Hospital.

* * *

MR. J. A. T. WHITE, M.R.C.S., L.R.C.P., to be Medical Officer for the Hatfield Sanitary District of the Dunmow Union.

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MR. W. ROYDEN, L.R.C.P., M.R.C.S., to be Medical Officer of Health for the Rural Sanitary District of the East and West Flegg Incorporation.

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DR. C. EARDLEY-WILMOT, M.D., B.S. (Dur.), to be Senior Assistant Medical Officer to the Middlesex County Asylum, Tooting.

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MR. L. W. ROLLESTON, M.D., B.S. (Dur.), to be Junior Assistant Medical Officer to the Middlesex County Asylum, Tooting.

* * *

MR. A. M. SHEPPARD, M.B., ChM. (Sydney), who has been studying at Bart.'s for the past two years, has been appointed House Surgeon to the London Ophthalmic Hospital, Gray's Inn Road.

BUCK, ARTHUR, L.R.C.P. (Lond.), M.R.C.S. (Eng.), to be Senior House Surgeon to the Sussex County Hospital, Brighton.

* * *

DAVIES, ARTHUR T., M.D. (Cantab.) F.R.C.P. (Lond.), to be a Physician to the Metropolitan Hospital, Kingsland Road, N.E.

* * *

GRIFFITHS, GEO. BATHO, L.R.C.P., M.R.C.S., to be Resident Medical Officer to the Eastern Dispensary, Bath.

* * *

LONG, FRANK T., L.R.C.P. (Lond.), M.R.C.S. (Eng.), to be Medical Officer and Public Vaccinator for the Colton District of the Ulverston Union.

ADMIRALTY.

SURGEON JOHN L. BAGNALL-OAKELEY, M.R.C.S. (Eng.), L.S.A. (Lond.), Naval Medical Service, to the *Phœbe*, Aug. 13th.

WAR OFFICE.

IN the *London Gazette* of Aug. 14th, 1894, SURGEON-CAPTAIN SINCLAIR WESTCOTT, M.R.C.S. (Eng.), L.R.C.P. (Edin.), Army Medical Staff, having completed twelve years' service on full pay, and passed the prescribed examination, is promoted to be Surgeon-Major.

SURGEON-MAJOR S. WESTCOTT served for a short time as a Surgeon in the Royal Navy, and passed into the Army top of his batch.

A Reminiscence of Forty Years Ago.

AMONGST the most honourable records of the ancient foundation of St. Bartholomew's, is the admission of the first woman-physician to the full educational advantages of the Hospital. I think that the generous-hearted students of this younger generation will be proud of the example set by their Alma Mater, and interested in knowing how it came about.

In 1849, after receiving the Doctor's degree in the University of Western New York, the advantage of further study in Europe was diligently sought for. Great difficulties then existed for obtaining the necessary facilities of study in so novel an undertaking.

In looking over old papers lately, I came across a letter of 1850, written by my cousin, Mr. J. Kenyon Blackwell (a well-known South Staffordshire Iron Master), who had kindly undertaken to make inquiries for me in relation to the possibility of medical study in London. This letter is of interest as recalling events of more than forty years ago, and explaining my connection with St. Bartholomew's. He writes to me in Paris, as follows:—"I obtained introductions from Dr. Carpenter to Dr. Sharpey at University College, and to Mr. Paget at St. Bartholomew's, and I also called on Mr. South at Guy's and St. Thomas's. Both Dr. Sharpey and Mr. South were interested, and sympathised in the object; they advised an application to the governing bodies. Dr. Sharpey was very polite, he could not, however, give a positive answer without consulting his colleagues. He suggested that if you decided on University College, you should address a letter to Dr. Walshe, Dean of the Faculty of Medicine, requesting permission to study, and he promised to support the application.

"The reception I met with from Mr. Paget was still warmer. He immediately said that he felt anxious about your success; that he fully entered into your motives; and that he not only felt a wish, but that he considered it to be his duty, to render you every assistance in his power. He also said that he felt no doubt his colleagues would view the subject in the same manner; he would consult them all, if I would give him a few days to do so. The enclosed letter is the result of the opinions of all, and final.

"From the warm interest he has manifested, if you decide to go to St. Bartholomew's, I feel certain you will find a powerful friend in him. He assured me also that he thought you would have nothing to apprehend with regard to the behaviour of the students themselves."

Such was my cordial and generous introduction to St. Bartholomew's. I received an "unlimited" card of admission; and during the year and a-half that I daily walked the Hospital, spending the chief part of each day in the wards, I found doctors, students, and nurses constantly and invariably friendly and helpful.

The Hospital contained at that time 580 beds, relieving 77,000 patients annually. The chief physicians were Drs. Hue, Roupell, and Burrows; and the chief surgeons, Messrs. Lawrence, Stanley, and Lloyd. The Faith wards, under Dr. Burrows, were my headquarters, where I studied several hours a day, and regularly followed the Physicians' clinical visits, meeting with invariable courtesy from the large class of students who followed these popular visits.

Even more valuable was the instruction obtained when following the visits of Drs. Bayly and Kirkes. Dr. Bayly was then carrying on his researches in relation to dysentery. He was so gentle, friendly, and learned in his art, that these private visits were of unique advantage.

I attended also Mr. Paget's admirable lectures on Pathology. They were given in the small amphitheatre which then existed; for the present large college buildings, library, and museum, were not then built. The museum was a small one, but I gratefully remember the many interesting objects shown me by Messrs. Luther Holden, and Holmes Coote.

Dr. Hue was especially friendly in his welcome to me, showing me everything of interest in his wards, and my note-books are full of valuable observations made under his guidance. He took me on one occasion by an underground passage to Christ's Hospital to taste the excellent pea soup for which that institution was famous!

During this time an introduction to Dr. Oldham procured a most interesting visit to Guy's Hospital. Of the 600 beds in that great institution, 20 beds, with a midwifery clinique, averaging 1,800 cases a year, were under Dr. Oldham's care, and four students were maintained at the Hospital under his special direction to look after this department. The museum of Guy's was at that date most admirably arranged; every specimen in the

three large rooms devoted to it being carefully labelled and exhibited for study, and the wax models of admirable workmanship. Dr. Oldham expressed great friendliness to women's study of medicine, and cordially offered to assist my sister, who was then commencing the study, should she come to England, and wish to obtain an entrance to Guy's Hospital.

I have always regarded the Medical Profession—rightly understood — as the noblest representative of Divine Beneficence, and I gladly recall the generous action of St. Bartholomew's in aiding my entrance into the Humane Profession.

ELIZABETH BLACKWELL.

Third Examination of the Conjoint Board.

AS is well known, there are to be in future four Examinations at the Conjoint Board, under the arrangements of the five years' Curriculum. The fourth Examination will be purely Clinical, and the third will include Medicine, Surgery, and Midwifery, as well as Forensic Medicine and Public Health.

The synopsis in the latter two subjects have recently been issued and are as follows:—

I. SYNOPSIS.

EXAMINATION IN FORENSIC MEDICINE.

I. Examination of Persons found dead, with reference to:—
   1. Identification.
   2. Time of Death.
   3. Cause of Death.

II. Violent causes of Death:—
   1. Drowning.
   2. Strangulation.
   3. Suffocation.
   4. Mechanical Injuries and Wounds.

III. Poisons and Poisoning:—
   1. Symptoms and post-mortem appearances in cases of poisoning by the following agents:—

Inorganic.

Mineral Acids.	Mercury.
Solutions of Alkalis.	Antimony.
Copper.	Arsenic.
Lead.	Phosphorus.

Organic.

Oxalic Acid.	Aconite.
Carbolic Acid.	Chloroform.
Opium.	Chloral Hydrate.
Strychnine.	Cyanides.
Belladonna.	

   2. Duties of Medical Men in cases of Poisoning, as regards—Observation; Treatment and Preservation of parts for Analysis.
   3. Preliminary Tests for Poisonous Substances for Clinical Use, before reference to an Analyst.

IV. Medico-legal points in connection with:—Pregnancy, Delivery, Rape, Criminal Abortion, Infanticide.

V. The Lunacy Laws, in so far as they affect the Medical Practitioner, when signing Certificates of Lunacy.

II. SYNOPSIS.

EXAMINATION IN PUBLIC HEALTH.

I. WATER, in its relations to Health and Disease:—
   1. The Characters and Classification of Drinking-Water.
   2. The Causes and Sources of the Impurities found in Water, and the Methods of Purification.
   3. The Diseases conveyed by Water and the Methods of dealing with Epidemics of such Diseases.

II. AIR, in relation to Health and Disease:—
   1. The Causes and Sources of the Impurities found in Air.
   2. The Diseases conveyed through the Air.
   3. The quantity of Air necessary for Health; the Principles of Ventilation.

III. SOIL, in relation to Health and Disease:—
   1. The Causes and Sources of the Impurities in the Soil, and the methods of dealing with them.
   2. Diseases connected with the Soil.
   3. The Methods of dealing with Excreta and Sewage.

IV. FOOD, in relation to Health and Disease:—
   1. Dietetics.
   2. The Common Adulterations of the Chief Articles of Diet.
   3. Diseases connected with Deficiency or Impurity of Food-supply.

V. THE DWELLING, in relation to Health and Disease:—
   The Principles of House-drainage.

VI. The Principles of Disinfection, and the Mode of Action of the Chief Disinfecting Agents.

VII. The Provisions of the Act for the Notification of Disease.

Births.

DOVE.—On August 5th, at Carshalton, Stapleton Hall-road, Stroud Green, N., the wife of Percy W. Dove, M.R.C.S., L.R.C.P., of a daughter.

BURTON.—On Thursday, August 9th, 1894, at Hosie Villa, 15, Vernon-road, Edgbaston, Birmingham, the wife of Surgeon-Major F. H. M. Burton, M.D., Army Medical Staff, of a son.

POWELL.—On August 10th, at Glenarm House, Upper Clapton, N.E., the wife of Herbert E. Powell, M.R.C.S., L.S.A., of a daughter.

KERR.—On August 21st, at 36, Oak-lane, Bradford, the wife of James Kerr, M.A., M.D., D.P.H., Cantab., of a son.

Marriages.

ON 22nd inst., at Littlemore Parish Church, by the father of the bride, and the Rev. Vernon T. Green, M.A., vicar, and the Rev. C. A. Comfort, M.A., Laurence A. Winter, M.R.C.S., L.R.C.P., of Chartham, Canterbury, Kent, elder son of the late L. Winter, Esq., of Clements, Snaresbrook, and Mrs. Winter, of the Manor House, Coendon, Thame, to Bessie Copeland, fourth daughter of the Rev. Hayman Cummings, Chaplain, Oxford County Asylum.

ACKNOWLEDGMENTS.

Guy's Hospital Gazette. St. George's Hospital Gazette, "*On the Cataract-Pricking of the Hindus,*" by DR. HIRSCHBERG, Ophthalmic Surgeon, Berlin; translated by Surgeon-Capt. Maynard, Patna (Reprint from *Indian Medical Gazette*).

JUL 23 1921